# CHALLENGES AND OPPORTUNITIES OF CIRCULAR ECONOMY AND GREEN ECONOMY

**Ligita Melece**
Institute of Agricultural Resources and Economics
ligita.melece@arei.lv

**Abstract.** The aim of research presented in this paper is to evaluate current state and trends for fulfilling global and Europe Union (EU) accepted targets of green growth (e.g. green economy and circular economy). In order to estimate the state and trends in Latvia, and to compare them with other EU countries, several appropriate indicators have been chosen. These indicators are: resource productivity, waste management and eco-innovation. The results show that Latvia is lagging behind not only the EU average, but also the Baltic States. Regarding the municipal waste recycling, Latvia with share 8 % of recycling waste in 2014 came last in the EU. Contrary to the trends of EU and other Baltic countries, the share or proportion of landfilled municipal waste has not decreased. The eco-innovation index, which characterizes countries' eco-innovation performance, shows that compared to the EU average, the Baltic States trail behind other EU countries. Moreover, Latvia is only on 24$^{th}$ position among the EU Member States.

**Keywords:** circular economy, green growth, resource efficiency, waste, eco-innovation.

## Introduction

Green growth is defined as fostering economic growth and development, while sustaining the natural assets base that provides the resources and environmental services on which we rely for our well-being [1; 2]. To do this it must catalyze investment and innovation which will underpin sustained growth and give rise to new economic opportunities [3; 4].

UNEP defines a green economy as one that results in "…improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities" [5]. In its simplest expression, a green economy is low-carbon, resource efficient, and socially inclusive. In a green economy, growth in income and employment are driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services [1; 5]. The green economic sectors (such as renewable energies, energy efficiency, retrofitting green technologies, organic agriculture, and waste management and recycling) have been growing over the last decade despite the economic crisis [4; 6].

Green (resource-efficient) economy will bring increased competitiveness and new sources of growth and jobs through cost savings from improved efficiency, commercialization of innovations and better management of resources. This requires policies that recognize the interdependencies between the economy, well-being and natural capital and seeks to remove barriers to improved resource efficiency, whilst providing a fair, flexible, predictable and coherent basis for business to operate.

The transition to a more circular economy, where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimized, is an essential contribution to the EU's efforts to develop a sustainable, low carbon, resource efficient and competitive economy [4; 7]. Such transition is the opportunity to transform EU economy and generate new and sustainable competitive advantages. The European Commission (EC) hopes to enhance reinventing the economy through the ambitious (according to previous measures) Circular Economy Package, launched in December 2015. The package aims to stimulate Europe's transition towards a circular economy which will boost global competitiveness, foster sustainable economic growth and generate new jobs [8].

In a circular economy, materials that can be recycled are injected back into the economy as new raw materials [8]. Implementation the principles of reduce, reuse, recycle (the 3Rs) is crucial to improving resource use, security and competitiveness while diminishing the associated environmental impacts [9]. Action on the circular economy therefore ties in closely with key EU priorities, including jobs and growth, the investment agenda, climate and energy, the social agenda and industrial innovation, and with global efforts on sustainable development [8].

It is widely recognized by scholars and experts on international and EU level that waste management and waste reduction is important resource to implement circular economy and green and

sustainable growth [2; 3; 5; 7; 9; 10]. In its Communication and Action Plan to promote Circular Economy, EC has highlighted as a priority activity the prevention of food waste [8].

This work is a preliminary research, and various issues are subject to future studies.

The aim of studies is to assess the state or status, current trends as well as disadvantages and gaps of policy and support measures, targeting to reach goals of green growth (economy) and its component - the circular economy in Latvia; and to develop some recommendations to improve the situation.

The policy and methodology of resource efficient green growth and its development's assessment are in the process of development and coordination stage on international and EU level. Therefore, the presented results of research contain novelty and provide a new understanding of the sustainable growth (green economy and circular economy) processes in Latvia.

## Materials and methods

The principal materials used for the studies are as follows: different sources of literature, e.g. scholars' articles, research papers and the reports of foreign and Latvian researchers, and institutions (e.g. international, EU, particularly EC, and governmental); published and unpublished data from Central Statistical Bureau of Latvia (CSB) [11], data from Eurostat databases [12], as well as data from the database of Eco-innovation Observatory [13].

The appropriate qualitative and quantitative research methods have been used in the process of study: monographic; content analysis and synthesis, data grouping, correlation and regression, logical and abstract constructive, expert, etc.

For evaluation of Latvia's current situation and position in the development processes of circular economy and green economy or growth; *inter alia*, comparing with other EU MS, appropriate indicators have been chosen. Even though GHG emission is the only well documented environmental impact indicator available at the global level [5], its assessment has not been included in the research.

In this paper the main attention is paid to indicators, characterizing significant Latvia's gaps to reach the goals and targets (int. al. common and approved on UN and EU level) of green economy (growth) and circular economy. Indicators and targets are important measurement tools that would enable policy makers to evaluate how effective policies are; to measure and foster progress towards the vision and objectives [4].

Based on the data availability [11-13], the calculations and assessment were made to evaluate the situation and trends relevant to the goals and targets of circular and green economy. Indicators based on review of literature sources (Table 1) have been selected to compare situation in Latvia with other EU MS and EU-28 (average), and among Baltic States or countries.

Table 1

**Indicators, used in research**

| Indicator | Interpretation |
|---|---|
| Resource | |
| Resource productivity: EUR·kg$^{-1}$; Index 2000 = 100 | Economic value generated per kg of raw material consumption |
| Turning waste into a resource | |
| Generation of waste (excluding major mineral wastes): kg per capita | Indicates weight of waste generated per inhabitant per year |
| Recycling rate of municipal waste: % of municipal waste | Share of recycled municipal waste, as a % of total municipal waste generated |
| Supporting research and innovation | |
| Eco-innovation index: EU = 100 | Provides indication of the progress being made in supporting activities that contribute to the shift to more resource efficient economic activities |

Resource productivity can be defined as the value obtained per unit of resource [14; 15; 16; 17]. It is measured as gross domestic product (GDP) over domestic material consumption (DMC) [18]. GDP

is measured using chain linked volumes; volume figures show the development over time excluding inflation and may be referred to as showing developments in real terms. The use of a volume series of GDP is important as the DMC used in the calculation of resource productivity is not directly affected by inflation. DMC measures the total amount (tonnes) of material directly used in an economy, either by businesses, government and other institutions for economic production or by households. DMC concerns to extracted natural resources per year [18].

One of the waste management indicators is municipal waste, which consists to a large extent of waste generated by households, but may also include similar wastes generated by small businesses and public institutions and collected by the municipality [18]. This part of municipal waste may vary from municipality to municipality and from country to country, depending on the local waste management system [18].

Eco-innovation index has been developed by the Eco-Innovation Observatory (EIO) and assesses eco-innovation performance across the 28 EU MS. The eco-innovation index has been developed using European Eco-Innovation Scoreboard (Eco-IS). Eco-IS is a composite index made up from 16 indicators, grouped into five thematic areas (indexes or indices): eco-innovation inputs, eco-innovation activities, eco-innovation outputs, resource efficiency and socio-economic outcomes [13].

## Results and discussion

### *Resource productivity*

Resource productivity is noted as lead indicator to measure the principal objective of the EU Roadmap, of improving economic performance while reducing pressure on natural resources [4].

The results of evaluation show (Fig. 1) that resource productivity of Baltic States is significantly lower than EU-28 (average). Estonian resource productivity is merely 23 % of the European average, Latvian and Lithuanian resource productivity is 26 % and 38 %, respectively. However, the trends differ considerably between countries. The impact of economic and financial crises has had damaging impact on the resource productivity in Estonia. Moreover, Estonia's resource productivity from 2005 to 2014 has decreased substantially. Lithuania shows higher values of indicator and significant increasing trend in the same period.

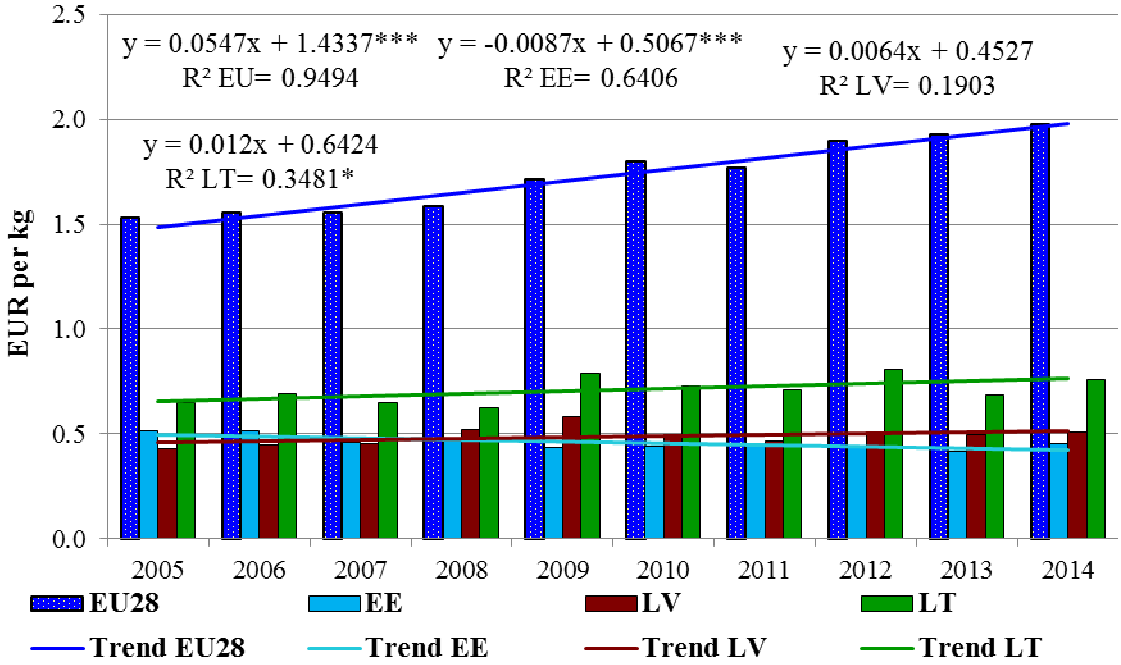


Fig. 1. **Trends of resource productivity (EUR per kg) in the Baltic countries and EU-28 (average), 2004-2014**

Contrary to Lithuania and Estonia, Latvia shows a very small increase or improvement following the economic and financial crisis (Fig. 1).

***Turning waste into a resource***

The EC has stressed that due to differences in national data collection methods and over time, waste statistics need to be used with caution, but despite this there are some clear trends [19].

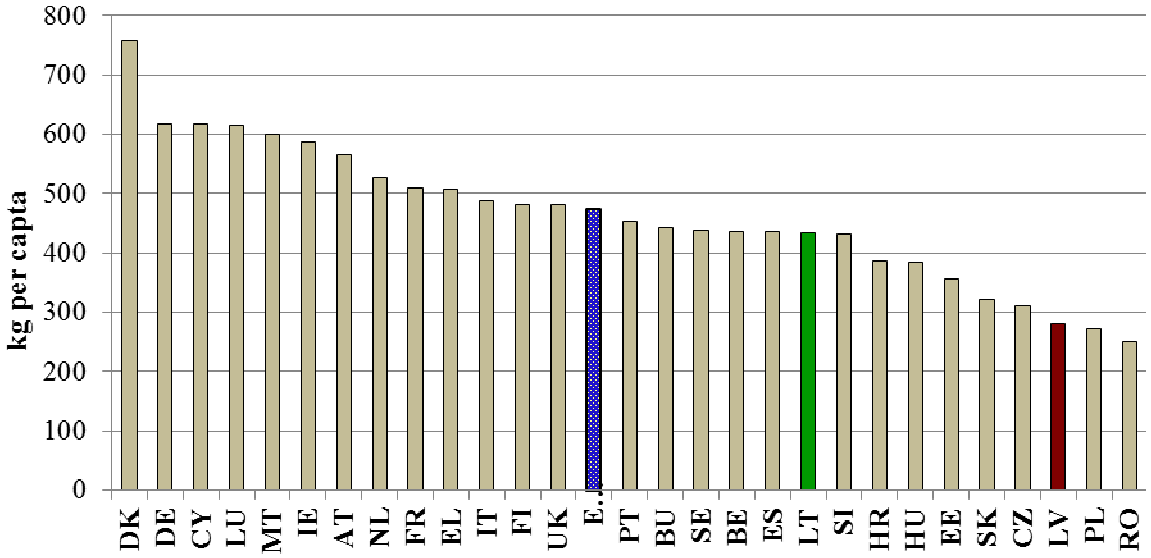


Fig. 2. **Municipal waste generation (kg per capita) in EU countries and EU-28 (average), 2014**

To help ensure full implementation of EU waste legislation and the waste hierarchy, the EC has identified main problems and their reasons relevant to the management of municipal waste in Latvia, e.g. high share of bio-degradable waste going to landfills; limited bio-waste collection and treatment infrastructure; insufficient statistics' on national and local level; limited measures for encouraging separate collection of bio-waste; limited number of scientific studies on national/regional level, i.e. bio-waste management [20; 21]. The proposals for measures addressing several problems have been provided by the EC, for example, increase progressively and differentiate the current landfill tax to higher total costs for landfilling than for alternative treatment; improve the quality of data/indicators regarding waste quantities and treatment; harmonize data collection with EU reporting requirements; composting of bio-degradable waste; conduct scientific studies in the field of bio-waste management, etc. [22]. Although these recommendations were provided in 2011, there still have been no obvious improvements, including in the trend of municipal wastes' recycling (Fig. 3).

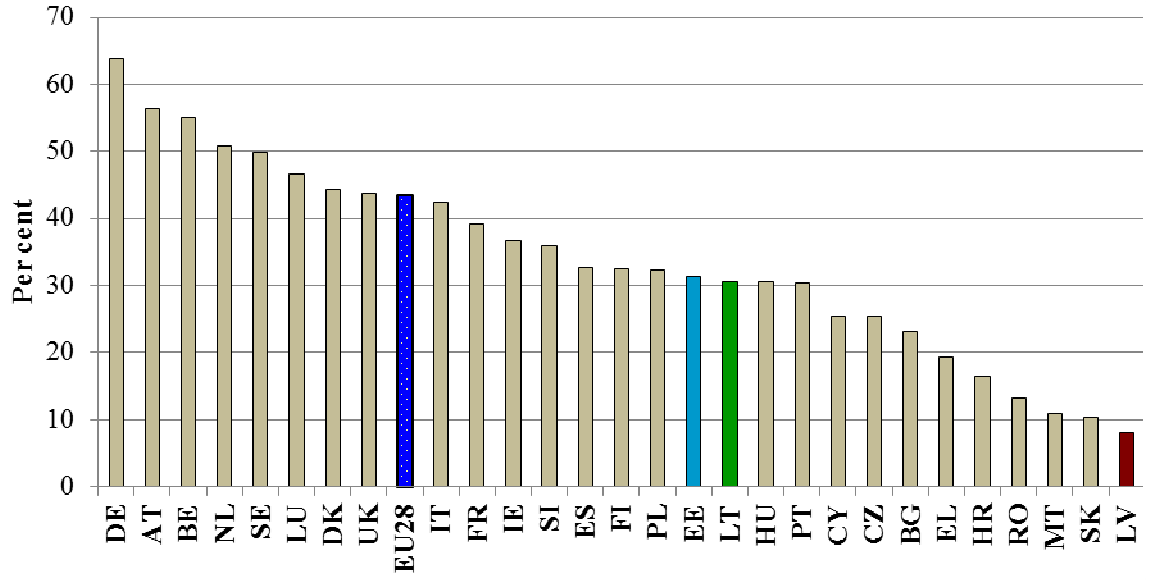


Fig. 3. **Recycling rate (%) of municipal waste EU countries and EU-28 (average), 2014**

Many EU MS, in particular Latvia, will need to make an extraordinary effort in order to achieve the target of 50 % recycling of some municipal waste streams by 2020 [19; 21].

On the waste hierarchy, landfill, which is common in Latvia, is the least preferred option for dealing with waste because landfilled resources are lost to the economy and can have adverse environmental impacts due to the production of methane and leachate.

Despite that, there is the lack of correct statistical data [19]; for estimation of important criteria - landfilled waste, the data [12] of treatment of municipal waste per capita per year were used. We compare the volume and trends of landfilled municipal waste among the Baltic States and EU-28 (average) results (Fig. 4). The results demonstrate that there is significant decrease observed in EU-28 (average), Estonia and Lithuania. In contrast, there is no considerable progress or improvements in this field in Latvia. Moreover, the volume of municipal landfill waste is more significant than in Estonia. This situation is even worse and has made it difficult to reach the targets and fulfil the waste management requirements, as set up in the EU legislation. Besides, landfilled waste will bolster GHG emissions.

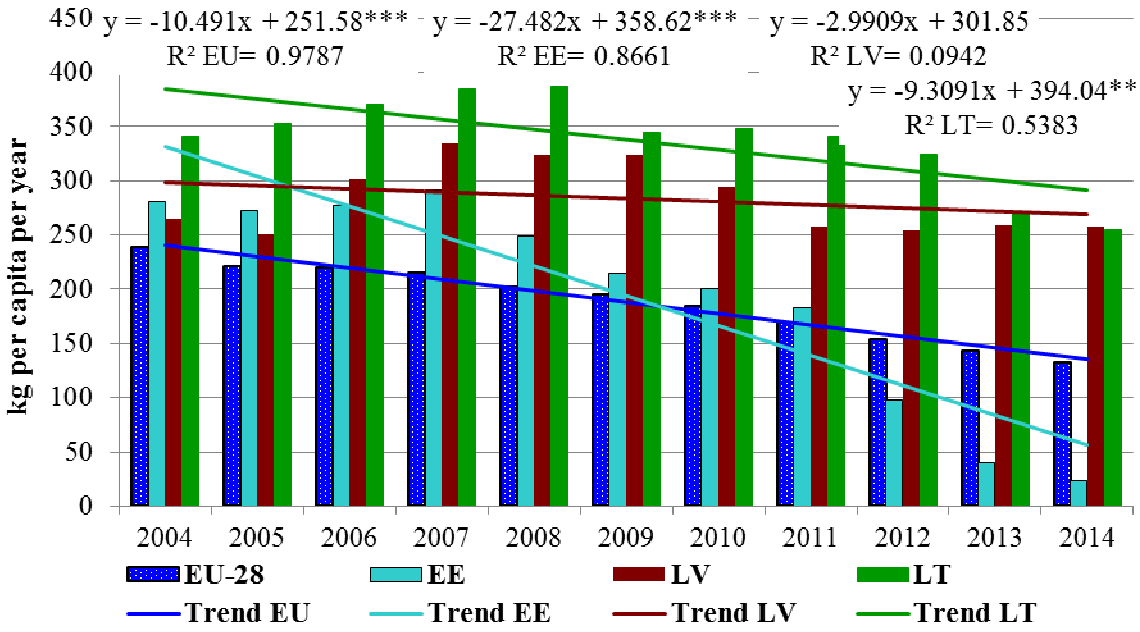


Fig. 4. **Volume and trend of landfilled municipal waste in Baltic countries and EU-28 (average), 2004-2014**

The UN has pointed to a target of reducing avoidable food waste by half by 2020 [4]. The need to prevent and reduce food waste is a subject of growing societal, economic, environmental and political interest. Besides that the wasting of food is an ethical and socio-economic issue, it also depletes the environment of limited natural resources. Moreover, reductions of food waste may reduce demands for increased production [23]. According to the assessment of food waste levels, around 88 million tonnes of food waste are produced in the EU-28 each year, amounting to an estimated 143 billion euros, which is equivalent of 20 % of total food produced in the EU [24].

It is decided that new indicators on food waste must be included on the EU level [8]. The food waste prevention could potentially mitigate the environmental pressures of food provision, and - particularly in the case of agriculture - compensate for the yield penalties [20].

However, in Baltic States, especially in Latvia, the issue of food waste treatment is not viewed as one of the prior issues in the area of waste management [25].

***Supporting research and innovation (eco-innovation)***

Resource efficient and circular economy requires a systematic change in production and consumption patterns. Innovations, and in particular eco-innovations, play a major role in developing new technologies, processes, products and services, and business models [19]. However, more investment is required to close the gap between the current state of, and the potential for, eco-innovation in the EU [19].

An important indicator measuring innovation and R&D is the eco-innovation index [19]. The eco-innovation index is calculated by the (unweighted) mean of the 16 indicators. Eco-Innovation Observatory EIO [13] has defined eco-innovation as "…the introduction of any new or significantly improved product (good or service), process, organizational change or marketing solution that reduces the use of natural resources (including materials, energy, water and land) and decreases the release of harmful substances across the whole life-cycle."

The top ranking EU countries for eco-innovation are Finland and Sweden whose score, relative to the EU average (Index = 100 points) is 138 points; Germany and Denmark had 132 and 129 points, respectively. The lowest eco-innovative indexes relative to the EU average are shown by Bulgaria (38 points), Poland (42 points) and Cyprus (43 points) (Fig. 5). Out of all 28 EU countries, Estonia ranked in 16th place with score of 72 points; Lithuania came 20th (66 points), while Latvia placed 24th (52 points).

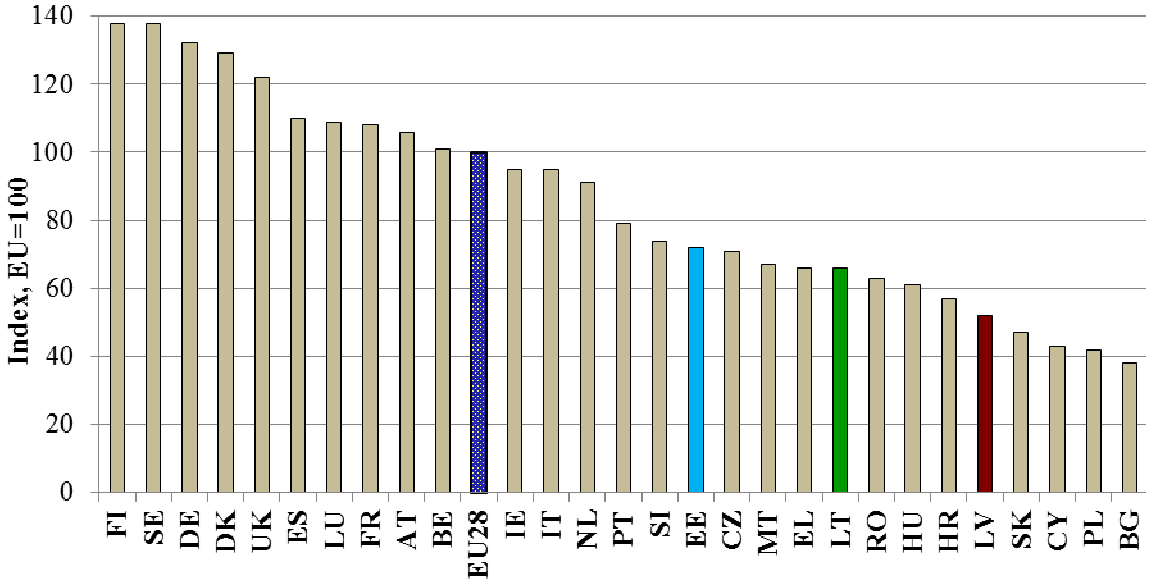


Fig. 5. **Eco-innovation index of EU countries and the EU-28 (average), 2013**

Some reasons for delays in regards to eco-innovation in Baltic States could be the following: lack of specific policy measures promoting eco-innovation in Estonia; absence of explicit eco-innovation policy strategy or an environmental action plan in Latvia [26].

The results of some studies suggest that the development of eco-innovation requires more knowledge and information than non-environmental innovation.

***Policy, governance and investments***

EC has put forward new legislative proposals on waste to provide a long-term vision for increasing recycling and reducing the landfilling of municipal waste, while taking account of differences between Member States [4; 8; 21]. The proposals set clear targets for reduction of waste and establish an ambitious and credible long-term path for waste management and recycling. Moreover, they include common EU targets, e.g. to recycle and reuse 70 % of municipal waste and to increase the recycling rate for packaging waste to 80 % by 2030 (with interim targets of 60 % by 2020 and 70 % by 2025); binding landfill target to reduce landfill to maximum of 10 % of municipal waste; and a ban on the landfilling of recyclable plastics, metals, glass, paper and cardboard, and biodegradable waste by 2025 [8; 21]. EC has approved the actions to reduce food waste to halve food waste by 2030; and to establish a common measurement methodology [24]. These proposals also encourage greater use of economic instruments to ensure coherence with the EU waste hierarchy [21].

EC recognized the key role EU Cohesion Policy in closing the investment gap for improved waste management and supporting the application of the waste hierarchy [4]. Therefore, policy makers need to reassess the priorities for investments of various EU funds in Latvia from 2014 to 2020. For example, total Cohesion Policy funding for Latvia worth around EUR 4.51 billion has been allocated.

EC [17] argued that the eco-innovation needs to be supported, in particular SMEs, which are active in this field. It is recognized by EC that: the faster development and marketing of eco-innovation is restricted by the lack of risk finance and support for demonstration; support is needed for the development of innovative solutions and new technologies, for testing, but also for implementation of its. SMEs especially need to have better access to funds for purposes of resource-efficient innovation; and the public funding is an important tool for assistance and support. The combination of public and private action is needed, where the focused discussions will be performed between policy makers and financiers or investors [17].

As the Resource Efficiency Scoreboard data show, some progress has been achieved. The impact of the 2008 financial crisis is palpable, but even this does not disguise the overall trends, many of which have taken a more sustainable direction. Eastern European countries are going through sustained economic growth (increasing consumption and production) but, at the same time, their production is more resource efficient than it was previously (higher GDP per unit of input – materials, energy, water, etc.)

Creating a green economy will require fundamental changes in the production consumption systems that meet basic demands, such as for food, mobility, energy and housing. This will depend on better implementation and integration of environmental and economic policies, a broader knowledge base for long-term transitions, and use of finance and fiscal policies to support major investments in innovation and infrastructure [20].

The transition to a circular economy will also require a qualified workforce with specific and sometimes new skills. The development of skills and other measures to support job creation in the green economy will be one of the priorities.

## Conclusions

1. The resource productivity of Baltic States is significantly lower than EU (EU-28) average. Estonian resource productivity is just 23 % of the European average, Latvian and Lithuanian 26 % and 38 %, respectively. While, the trends differ considerably between countries. Estonian resource productivity from 2005 to 2014 has significantly decreased; Lithuania shows significant increasing trend, but Latvia - a very small increase, in the same period.
2. The volume and trends of landfilled municipal waste (kg per capita per year) significantly decreased in EU (EU-28 average, Estonia and Lithuania. In Latvia there is no considerable progress or improvements in this field. Moreover, the volume of municipal landfilled waste per inhabitant per year is more significant than in EU and Estonia.
3. The eco-innovation index, which characterizes countries' eco-innovation performance, shows that compared to the EU average (100 points) the Baltic States lagging behind other EU countries. Among the Baltic States, Estonia, ranking 16th among EU-28 with 72 points, is a leader achieving the best results in the eco-innovation performance; Lithuania (20th place with 66 points), but Latvia (24th place with 52 points) lags behind.
4. Various governance principles and measures, including public financing (national and EU), play an important role in achieving the targets of the circular and green economy, particularly in the sphere of resource productivity and efficiency, waste management (i.e. food waste), eco-innovation.
5. The further more detailed studies are needed in order to clarify the priorities and the objectives in Latvia to be achieved cost-effectively targets for sustainable green growth, based on principles of the circular economy and requirements of EU legislation in this sphere.

## Acknowledgments

This research has been funded by the National Research Programme „Innovation and Sustainable Development" (SUSTINNO).

**References**


1. OECD. Towards Green Growth, 2011. [online] [17.01.2016]. Available at: http://www.oecd.org/greengrowth
2. World Bank. Inclusive Green Growth: The Pathway to Sustainable Development. Washington DC: World Bank, 2012. 192 p.
3. OECD Green Growth: Material Resources, Productivity and the Environment. Paris: OECD Publishing, 2015. 176 p.
4. EC. Circular Economy Strategy. Roadmap, 2015. [online] [11.01.2016]. Available at: http://ec.europa.eu/smart-regulation/impact/planned_ia/docs/2015_env_065_env+_032_circular_economy_en.pdf
5. UNEP. Decoupling natural resource use and environmental impacts from economic growth. Paris: United Nations Environment Programme, 2011. 174 p.
6. EEA. Resource efficiency in Europe: Policies and approaches in 31 EEA member and cooperating countries. EEA, Copenhagen, 2011, 84 pp.
7. EC. Progress Report on the Roadmap to a Resource Efficient Europe. SWD/2014/0206 final/2. Brussels, 25.9.2014.
8. EC. Closing the loop - An EU action plan for the Circular Economy, COM (2015) 614 final, Brussels, 2.12.2015.
9. OECD. Policy Guidance on Resource Efficiency. Paris: OECD Publishing, 2016. 128 p.
10. Demurtas, A., Sousanoglou, A., Morton, G., Humphris-Bach, A., Essig, C. et al. EU Resource Efficiency Scoreboard 2014. Brussels: European Union, 2015. 68 p.
11. CSB of Latvia. Statistics Database. [online] [06.12.2015]. Available at: http://www.csb.gov.lv/en/dati/statistics-database-30501.html.
12. Eurostat. Database. [online] [08.01.2016]. Available at: http://ec.europa.eu/eurostat/data/database.
13. Eco-innovation Observatory. Database. [online] [15.01.2016]. Available at: http://www.eco-innovation.eu
14. OECD. Green Growth Indicators 2014. [online] [12.12.2015]. Available at: http://dx.doi.org/10.1787/9789264202030-en
15. OECD. Green Growth Studies Green Growth Indicators for Agriculture: A Preliminary Assessment: A Preliminary Assessment. Paris: OECD Publishing, 2014. 96 p.
16. EC. Roadmap to a Resource Efficient Europe, COM (2011) 571 final, Brussels, 20.9.2011.
17. EC. Analysis associated with the Roadmap to a Resource Efficient Europe, Part II, SEC (2011) 1067 final, Brussels, 20.9.2011.
18. Eurostat. Statistics Explained. [online] [17.01.2016]. Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php.
19. EC. EU Resource Efficiency Scoreboard 2015. Brussels: European Union, 2016. 72 p.
20. EEA. The European environment – state and outlook 2015: synthesis report. Copenhagen: European Environment Agency, 2015. 212 p.
21. EC. Towards a circular economy – A zero waste programme for Europe, COM (2014) 398 final, Brussels, 2.07.2014.
22. EC. Roadmap for Latvia. Services to support Member States' enforcement actions and inspections concerning the application of EU waste legislation, 2011. [online] [11.01.2016]. Available at: http://ec.europa.eu/environment/waste/framework/pdf
23. Ekroos, J., Olsson, O., Rundlof, M., Watzold, F., Smith, H.G. Optimizing agri-environment schemes for biodiversity, ecosystem services or both? Biological Conservation, vol. 172, 2014, pp. 65-71.
24. EC. Food Waste. [online] [17.01.2016]. Available at: http://ec.europa.eu/food/safety/food_waste/index_en.htm
25. Filho, W.L., Kovaleva, M. Food Waste and Sustainable Food Waste Management in the Baltic Sea Region. London: Springer, 2014. 222 p.
26. Barsoumian, S., Severin, A., van der Spek, T. Eco-innovation and national cluster policies in Europe: A Qualitative Review. – Brussels: Europe EEIG, 2011. 95 p.